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NEXT GENERATION DIGITAL CONTINUITY TO ADDRESS RAILWAY CHALLENGES AT SCALE

Capgemini Engineering, partnering on the
innovative light train with its digital twin solution

Introduction

The innovative light train is a project led by a consortium of partners headed by SNCF. Its objective is to revitalize low density rail lines by offering more services at controlled costs.

The innovative light train will lead to a 30% reduction in operating costs, rolling stock, and infrastructure, thanks to advanced technologies and a systemic approach.

The train itself will be built around a single modular platform that can be adapted to passenger and freight needs. Its eco-friendly design and the use of an electric motor – using batteries and hydrogen cells – will greatly limit its carbon footprint. Certain innovations, such as the single digital driver’s cab, will reduce its weight to save energy, as well as put less strain on the track. A systemic project, that will include signaling, command-and-control system, infrastructure monitoring and rolling stock.

When launched in 2029, the innovative light train will enhance France’s Transport Express Regional (TER) offer, with other solutions such as Draisy and Flexy, developed by SNCF as part of other industrial consortiums.

In this context, to ensure efficiency and project optimization, Capgemini Engineering provides its expertise in digital continuity thanks to its design-to-x approach for engineering rolling stock. Capgemini Engineering ensures the strategy and development of the digital twin of the light rail system which will allow to accelerate the developments, to simulate and pre-validate the solutions upstream in correlation with the future tests on pilot line.



Overview

The rail network and its development are the foundation of tomorrow’s public transportation. Mobility, which is a public service issue, is one of the answers to today’s social and economic challenges. It is therefore essential to develop innovative solutions adapted to less frequented lines and areas not served by train service. The aim of the innovative light train is to reinvigorate these areas.

The objective is to develop new solutions offering transport capacities adapted to the needs of each region. The light train can make it possible to extend the scope of conventional trains and provide a more thorough service to all regions.



A new approach to unlocking innovation

12,000 km of France’s rail lines – 42% of the network – is currently inaccessible to 10% of rail traffic. This has led stakeholders – SNCF, the state and its departments, the regions, and the organizing authorities – to redefine the relevance of these lines regarding mobility needs, regional development, and the National Low Carbon Strategy (SNBC). The operation of these lines must also be economically sustainable. In the absence of relevant industrial solutions and to meet the needs of the affected regions, the innovative light train project consortium proposes a new approach to unlock the innovations required to build a modular and cost-effective rail system adapted to these lines. SNCF has created an ecosystem of partners to define a new model. This new complete rail system is based on an innovative light train and an adapted infrastructure approach, for simplified and economical operation. The objective is to provide a financially sustainable response, adapted to the needs of the territories. By maximizing synergies, the new rolling stock will integrate the necessary building blocks, without compromising safety. It includes adapted interior fittings, a digital driver’s cab, a ground connection that guarantees comfort and railway dynamics, a low-emission engine, and the integration of autonomous train technologies. The project’s approach to digitalization will incorporate signaling and control systems, infrastructure, and rolling stock monitoring. It will be implemented in the short term on one or more lines and on a laboratory train.

Implementation schedule

To maximize the project’s industrial potential, the consortium will implement an innovative approach on a tight schedule.

Two years after the start of the project, it will offer potential solutions that can perform in real-world conditions in those territories that have confirmed interest:

- Phase 1, 2022-2024 – studies and demonstrations on test models
- Phase 2, 2024-2026 – construction of a light rail demonstrator

The launch of phase 2 will depend on the results of phase 1 and the capacity of stakeholders across industry, regions, and operators. The new rail system is scheduled to be put into circulation by 2029.

Expected results

Innovation

The consortium is taking an innovative approach to propose new solutions for the low density regional lines. It will take all the parameters of the economics of these lines into account, and take a global approach to the complete lifecycle of the rail system, which will incorporate the cost of renewal of rolling stock and regeneration of the infrastructure. The objective is to reduce the total cost of the overall system by 30%.

Economic and social

The design guidelines for the light rail system will allow for a significant reduction in operating costs and a limitation of investments in the affected rail lines. The project will listen to the relevant communities to introduce new services of interest and revitalize the areas served by these trains.

Environment

Beyond the carbon footprint, the ambition is to quantify the environmental footprint of the future train, with a focus on its consumption of non-renewable resources, its damage to the environment – CO2, NO2, and any harm to humans and other species during its lifecycle.

Application and valorization

At the end of the project, the organizing authorities will choose whether to continue investments in rail operations on the affected rail lines. Thanks to the transparent and open structure proposed by the consortium, the organizing authorities will have been able to test the innovations in real-life situations and select the most relevant industrial partners. They will have been able to follow the development studies, guide the strategic choices, and predict the evolutions necessary to build a light train as part of a cost-effective system. Thus, they will have all the elements they need to decide which equipment or lines to renew.



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Project illustration: Innovative Light Train Concept – Credit: SNCF

Why Capgemini Engineering?

To ensure efficiency and project optimization, Capgemini Engineering provides expertise in digital continuity thanks to its design-to-x approach for engineering rolling stock. Capgemini Engineering is delivering the strategy and development of the digital twin of the light rail system which will allow the consortium to accelerate developments, then simulate and pre-validate the solutions upstream in correlation with future tests on pilot lines.

Find out more about how Capgemini Engineering can partner with players in the rail industry to ensure digital twin development for the light rail system.

Get in touch to set up a call or meeting with a Capgemini Engineering expert today:

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About Capgemini Engineering

Capgemini Engineering combines, under one brand, a unique set of strengths from across the Capgemini Group: the world leading engineering and R&D services of Altran – acquired by Capgemini in 2020 – and Capgemini's digital manufacturing expertise. With broad industry knowledge and cutting-edge technologies in digital and software, Capgemini Engineering supports the convergence of the physical and digital worlds. Combined with the capabilities of the rest of the group, it helps clients to accelerate their journey towards Intelligent Industry. Capgemini Engineering has more than 52,000 engineer and scientist team members in over 30 countries across sectors including aeronautics, automotive, railways, communications, energy, life sciences, semiconductors, software & internet, space & defence, and consumer products.

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